have an upper hand. Injectable hydrogels can adapt well into the margins of the defect, can be placed with minimal invasiveness into deep defect sites. Thus, injectable hydrogels can greatly reduce the surgical time, scar formation, post-operative pain and recovery time (Zhao et al. 2010). Hydrogels, which can adapt well to the defect margins, will provide better opportunities for cell recruitment and neovascularization from the adjacent healthy tissues. Furthermore, most of the hydrogels can mimic the native ECM, thus providing a favorable environment for the cells to proliferate and differentiate (Tibbitt et al. 2009). By incorporating different osteoinductive components (Gkioni et al. 2010; Eglin et al. 2006), growth factors (Tabata et al. 1998; Yamamoto et al. 2000), drugs like antibiotics (Niranjan et al. 2013), etc., one can further improve outcome of the treatment.

Hydrogels consists of three-dimensional crosslinked hydrophilic polymeric networks that absorb and retain large amounts of water or biological fluids (Kopecek 2007). Hydrogels have several unique characteristic features, which include resemblance of tissue, ECM, supports cell proliferation and migration, controlled release of growth factors, minimal mechanical irritation to surrounding tissue and nutrient diffusion that supports the viability and proliferation of cells (Uludag et al. 2000; Slaughter et al. 2009; Tan et al. 2010). These properties allow their usage in tissue engineering and regenerative medicine (TERM) as carriers for growth factors (Cai et al. 2005), cells (Gerecht et al. 2007), drugs (Tiller 2003) and genes (Li et al. 2003). TERM is an interdisciplinary field which aims in supporting, rejuvenating and/or replacing the partially functioning or the damaged tissues, caused either by acute trauma, surgical removal, congenital diseases or chronic problems (Furth et al. 2007).

Conventional methods for tissue regeneration, like preformed hydrogels or scaffolds, face the problem of surgical implantation, increasing the risk of infections and improper adaptation to the defect site, which could lead to scaffold failure. By overcoming these problems, injectable hydrogels are gaining importance in the field of TERM as they can reach the defects in very deep tissues, with minimum invasiveness and provide better defect margin adaptation. This would result in reduce risk of infection, less scarring and less pain (Patenaude et al. 2014). Overall it reflects the importance of injectable hydrogels in tissue engineering area compared with traditional scaffolds. In this chapter, recent developments in several injectable hydrogels for bone regeneration are highlighted.

Based on their origins two kinds of biodegradable polymers are used for preparation of injectable hydrogels: Naturally derived and synthetic polymers. In comparison with synthetic polymers, most but not all naturally derived polymers are expected to have better interaction with cells along with increased cell proliferation and differentiation (Stevens et al. 2005). On the other hand, synthetic polymers possess tuneable mechanical properties and degradation profile (Drury et al. 2003). Mutually exclusive advantages of these polymers have motivated the researchers to investigate combinational systems of synthetic and naturally derived polymers, thereby improving the properties injectable hydrogels (Sionkowska 2011). Injectable hydrogels are prepared using various physical and chemical crosslinking methods.